

CLAIMS:

1. A backscatter interrogator comprising:  
a data path configured to communicate a data signal;  
a signal generator configured to generate a carrier signal; and  
a modulator coupled with the data path and the signal generator, the modulator being configured to spread the data signal to define a spread data signal and amplitude modulate the carrier signal using the spread data signal, the modulator being further configured to phase modulate the carrier signal.

2. The backscatter interrogator according to claim 1 wherein the modulator includes a mixer and circuitry configured to apply a tri-level signal to the mixer to implement the amplitude modulation and the phase modulation of the carrier signal.

3. The backscatter interrogator according to claim 1 wherein the modulator is configured to spread the data signal using a pseudo-noise sequence.

4. The backscatter interrogator according to claim 1 wherein the modulator is configured to invert the spread data signal.

1           5.     The backscatter interrogator according to claim 1 wherein the  
2     modulator is configured to invert the spread data signal using a pseudo-  
3     noise sequence responsive to the spread data signal being a predetermined  
4     value.

5  
6           6.     The backscatter interrogator according to claim 1 wherein the  
7     modulator includes a filter configured to band limit the spread data signal.

8  
9           7.     The backscatter interrogator according to claim 1 wherein the  
10    signal generator is configured to output a microwave carrier signal.

11  
12          8.     A backscatter interrogator comprising:  
13          a data path configured to communicate a data signal;  
14          a signal generator configured to output a microwave carrier signal;  
15          and

16          a modulator coupled with the data path and the signal generator, the  
17          modulator being configured to spread the data signal to define a spread  
18          data signal and selectively invert the spread data signal, the modulator  
19          being further configured to band limit the inverted spread data signal and  
20          modulate the carrier signal using the band limited data signal.

21  
22          9.     The backscatter interrogator according to claim 8 wherein the  
23          modulator is configured to invert the spread data signal responsive to the  
24          spread data signal being a predetermined value.

1           10. The backscatter interrogator according to claim 8 wherein the  
2 modulator is configured to randomly invert the spread data signal.

3  
4           11. The backscatter interrogator according to claim 8 wherein the  
5 modulator is configured to amplitude modulate and phase modulate the  
6 carrier signal.

7  
8           12. A backscatter communication system comprising:  
9           an interrogator configured to spread a data signal to define a spread  
10 data signal, amplitude modulate a carrier signal using the spread data  
11 signal, phase modulate the carrier signal using the spread data signal, and  
12 output the amplitude modulated and phase modulated carrier signal; and  
13           an electronic communication device configured to output a backscatter  
14 reply signal responsive to reception of the amplitude modulated and phase  
15 modulated carrier signal.

16  
17           13. The backscatter communication system according to claim 12  
18 wherein the interrogator is configured to output a microwave amplitude  
19 modulated and phase modulated carrier signal and the electronic  
20 communication device is configured to output a microwave reply signal.

21  
22           14. The backscatter communication system according to claim 12  
23 wherein the interrogator is configured to band limit the spread data signal.  
24

15. A communication system comprising:

an interrogator including:

a data path configured to communicate a data signal;

a signal generator configured to output a carrier signal; and

a modulator configured to spread the data signal to define a spread data signal, filter the spread data signal to define a filtered data signal, amplitude modulate the carrier signal using the filtered data signal, phase modulate the carrier signal using the filtered data signal, and output the amplitude modulated and phase modulated carrier signal; and

an electronic communication device configured to receive the amplitude modulated and phase modulated carrier signal and output a reply signal responsive to reception of the amplitude modulated and phase modulated carrier signal.

16. The communication system according to claim 15 wherein the interrogator is configured to output a microwave amplitude modulated and phase modulated carrier signal and the electronic communication device is configured to output a microwave reply signal.

17. The communication system according to claim 15 wherein the communication system comprises a backscatter communication system.

1 18. The communication system according to claim 15 wherein the  
2 modulator is configured to invert the spread data signal responsive to the  
3 spread data signal being a predetermined value.  
4

5 19. A backscatter communication method comprising:  
6 providing a data signal;  
7 providing a carrier signal;  
8 spreading the data signal to define a spread data signal;  
9 amplitude modulating the carrier signal using the spread data signal;  
10 phase modulating the carrier signal; and  
11 communicating the amplitude modulated and phase modulated carrier  
12 signal.  
13

14 20. The method according to claim 19 further comprising  
15 selectively inverting the spread data signal.  
16

17 21. The method according to claim 20 wherein the phase  
18 modulating is responsive to the inverting.  
19

20 22. The method according to claim 20 further comprising  
21 synchronizing the inverting with the spread data signal.  
22

23 23. The method according to claim 19 further comprising randomly  
24 inverting the spread data signal using a pseudo-noise sequence.

1           24. The method according to claim 19 further comprising band  
2 limiting the spread data signal.

3  
4           25. The method according to claim 19 wherein the spreading  
5 comprises encoding a pseudo-noise sequence with the data signal.

6  
7           26. A method of communication in a backscatter system including  
8 an interrogator and a communication device comprising:

9           providing a data signal;

10          providing a carrier signal;

11          spreading the data signal to define a spread data signal;

12          modulating the carrier signal using the spread data signal;

13          communicating the modulated carrier signal; and

14          suppressing the carrier signal during the communicating.

15  
16          27. The method according to claim 26 further comprising band  
17 limiting the spread data signal.

18  
19          28. The method according to claim 26 wherein the modulating  
20 comprises amplitude modulating and phase modulating using the data signal.

21  
22          29. The method according to claim 26 wherein the suppressing  
23 comprises suppressing an amplitude modulated carrier signal.

30. A backscatter communication method comprising:  
 providing a data signal;  
 providing a carrier signal;  
 spreading the data signal to define a spread data signal;  
 selectively inverting the spread data signal;  
 amplitude modulating the carrier signal using the data signal; and  
 communicating the modulated carrier signal.

31. The method according to claim 30 wherein the providing comprises providing a microwave carrier signal.

32. The method according to claim 30 further comprising phase modulating the carrier signal responsive to the inverting.

33. The method according to claim 30 further comprising phase modulating the carrier signal using a tri-level signal corresponding to the inverted data signal.

34. The method according to claim 30 wherein the inverting comprises random inverting using a pseudo-noise sequence.

35. The method according to claim 30 further comprising band limiting the spread data signal.

36. A backscatter communication method comprising:

providing a data signal;

providing a microwave carrier signal;

providing a first code and a second code;

spreading the data signal according to the first code to define a spread data signal;

inverting the spread data signal according to the second code;

band limiting the spread data signal;

amplitude modulating the carrier signal using the band limited data signal;

phase modulating the carrier signal using the band limited data signal; and

communicating the amplitude modulated and phase modulated carrier signal.

37. The method according to claim 36 further comprising synchronizing the inverting with the spread data signal.

38. The method according to claim 37 wherein the synchronizing comprises inverting responsive to the spread data signal being a predetermined value.



1           39. The method according to claim 36 wherein the providing the  
2 first code and the second code comprise providing respective pseudo-noise  
3 sequences.

4  
5           40. The method according to claim 36 wherein the phase  
6 modulating is responsive to the inverting.

7  
8           41. A method of communication in a backscatter system including  
9 an interrogator and a communication device comprising:

10           providing a data signal;

11           providing a microwave carrier signal; and

12           modulating the microwave carrier signal using a tri-level signal  
13 corresponding to the data signal.

14  
15           42. The method according to claim 41 further comprising spreading  
16 the data signal to define a spread data signal.

17  
18           43. The method according to claim 42 further comprising band  
19 limiting the spread data signal.

20  
21           44. The method according to claim 41 further comprising  
22 selectively inverting the data signal.

1           45. The method according to claim 41 further comprising spreading  
2 the data signal into a plurality of chips individually corresponding to one  
3 of two values.

4  
5           46. The method according to claim 45 further comprising inverting  
6 chips of the data signal.

7  
8           47. The method according to claim 46 further comprising  
9 synchronizing the inverting and the spreading.  
10  
11  
12  
13  
14  
15  
16  
17  
18  
19  
20  
21  
22  
23  
24